

WHAT IS CLAIMED IS:

1. An apparatus comprising a distributed resonant tunneling section which includes:

5 a plurality of inductive portions coupled in series with each other between first and second nodes, such that a respective further node is present between each adjacent pair of said inductive portions; and

10 a plurality of resonant tunneling device portions, each said resonant tunneling device portion being coupled between a third node and a respective said further node.

2. An apparatus according to Claim 1,

15 wherein said inductive portions each include a respective discrete inductor; and

wherein said resonant tunneling device portions each include a respective discrete resonant tunneling diode.

3. An apparatus according to Claim 1, comprising an  
20 integrated circuit which includes said first and second nodes at respective spaced first and second locations, and which includes first and second sections that each extend from a region of said first location to a region of said second location, said first section including a  
25 plurality of different portions which each include a respective said inductive portion, and said second section including a plurality of different portions which each include a respective said resonant tunneling device portion.

4. An apparatus according to Claim 3, wherein said second section includes a plurality of layers which each extend from the region of said first location to the region of said second location, and which each include a plurality of portions that are each part of a respective said resonant tunneling device portion.

5. An apparatus according to Claim 4, wherein said layers of said second section include, in sequence, first, second, third, fourth and fifth layers, said third layer being a lightly doped semiconductor material, said second and fourth layers each being an insulating material, and said first and fifth layers each being a highly doped semiconductor material which is electrically conductive.

6. An apparatus according to Claim 5, including first and second electrically conductive contacts which each extend from the region of said first location to the region of said second location, said first contact being provided on a surface of said fifth layer spaced from said fourth layer, and said second contact being provided on a surface of said first layer spaced from said second layer.

7. An apparatus according to Claim 4, wherein said layers of said second section include, in sequence, first, second, third, fourth and fifth layers, said third and fifth layers being a lightly doped semiconductor material, said second and fourth layers each being an insulating material, and said first layer being a highly doped semiconductor material which is electrically conductive, said fifth layer being thicker than any of said first, second, third and fourth layers.

8. An apparatus according to Claim 7, including first and second electrically conductive contacts which each extend from the region of said first location to the region of said second location, said first contact being provided on a surface of said fifth layer spaced from said fourth layer, and said second contact being provided on a surface of said first layer spaced from said second layer.

9. An apparatus according to Claim 4, wherein said second section is elongate in a direction extending between said first and second locations.

10. An apparatus according to Claim 4, wherein said first section includes a layer which has a plurality of portions that are each part of a respective said inductive portion.

11. An apparatus according to Claim 1, including a bias section which effects biasing of each of said resonant tunneling device portions for operation in a mode in which said resonant tunneling device portions each exhibit a negative resistance.

12. An apparatus according to Claim 11, including circuitry coupled to said first, second and third nodes of said distributed resonant tunneling section, said distributed resonant tunneling section effecting amplification, as a function of gain derived from said negative resistance of said resonant tunneling device, of a signal applied between said first and third nodes by said circuitry.

13. An apparatus according to Claim 12, wherein said circuitry includes a load which is coupled between said second and third nodes, said load having an impedance that is substantially matched to an effective impedance of said distributed resonant tunneling section.

14. An apparatus according to Claim 11,  
wherein a distance between said first and second locations is approximately an integer multiple of one-fourth of a wavelength of a selected frequency; and  
including circuitry coupled to said first, second and third nodes of said distributed resonant tunneling section, said distributed resonant tunneling section oscillating at said selected frequency as a function of gain derived from said negative resistance of said resonant tunneling device.

15. An apparatus according to Claim 14, wherein said circuitry includes:

5 a power source which is coupled between said first and third nodes; and

a load which is coupled between said second and third nodes, said load having an impedance which is substantially different from an effective impedance of said distributed resonant tunneling section.

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16. A method of forming a distributed resonant tunneling section, comprising:

5 coupling a plurality of inductive portions in series with each other between first and second nodes in a manner so that a respective further node is present between each adjacent pair of said inductive portions; and

10 coupling each of a plurality of resonant tunneling device portions between a third node and a respective said further node.

17. A method according to Claim 16, including:

15 configuring said inductive portions so that they each include a respective discrete inductor; and

configuring said resonant tunneling device portions so that they each include a respective discrete resonant tunneling diode.

20 18. A method according to Claim 16, including:

providing an integrated circuit which includes said first and second nodes at respective spaced first and second locations, and which includes first and second sections that each extend from a region of said first location to a region of said second location;

25 configuring said first section to have a plurality of different portions which each include a respective said inductive portion; and

30 configuring said second section to have a plurality of different portions which each include a respective said resonant tunneling device portion.

19. A method according to Claim 18, wherein said configuring of said second section includes configuring said second section to have a plurality of layers which each extend from the region of said first location to the region of said second location, and which each include a plurality of portions that are each part of a respective said resonant tunneling device portion.

20. A method according to Claim 19, wherein said configuring of said first section includes configuring said first section to have a layer which has a plurality of portions that are each part of a respective said inductive portion.

21. A method according to Claim 16, including biasing each of said resonant tunneling device portions for operation in a mode in which said resonant tunneling device portions each exhibit a negative resistance.

22. A method according to Claim 21, including causing said distributed resonant tunneling section to effect amplification, as a function of gain derived from said negative resistance of said resonant tunneling device, of a signal applied between said first and third nodes.

23. A method according to Claim 21, including:  
selecting a distance between said first and second  
locations to be approximately an integer multiple of one-  
5 fourth of a wavelength of a selected frequency; and  
causing said distributed resonant tunneling section  
to oscillate at said selected frequency as a function of  
gain derived from said negative resistance of said  
resonant tunneling device.